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ABSTRACT

Prior research on the information-seeking process, conducted by Kuhlthau in the school library setting, led to the identification of a six-stage model of the search process, describing cognitive and affective symptoms commonly experienced by library users. The present study was designed to determine whether that model is generalizable to other types of libraries. Findings indicate that, in general, the model also holds for users in academic and public libraries. The problem addressed is the complex sense-making process of users in an information search over an extended period of time, particularly changes in thoughts and feelings as a search progresses. The work is in the tradition of Belkin's anomalous state of knowledge, Taylor's levels of information need, and Dervin's sense-making. Findings indicate that thoughts about a topic become clearer and more focused as one moves through the search process, seeking more relevant and pertinent information. Feelings accompanying these changes matched those predicted in the Kuhlthau Model with confidence steadily increasing. Uncertainty, confusion, and frustration decreased and feelings of being satisfied, sure, and relieved increased during the search process. However, participants' perceptions of the search task often did not match the cognitive and affective symptoms predicted by the early stages of the model. Activities designed to infuse the findings into practice included the development of an institute for practicing libraries and the design of learning modules for MLS programs. A symposium for scholars actively engaged in this field of research was also planned. (MAB)

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FACILITATING INFORMATION SEEKING THROUGH COGNITIVE MODELING OF THE SEARCH PROCESS

A Library Studies Research Project

Conducted by
Rutgers, The State University of New Jersey
School of Communication, Information,
and Library Studies

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EXECUTIVE SUMMARY

Prior research on the information-seeking process, conducted by Kuhlthau in the school library setting, led to the identification of a six-stage model of the search process, describing cognitive and affective symptoms commonly experienced by library users. The purpose of the present study was to determine whether that model is generalizable to other types of libraries. Findings indicate that, in the main, the model holds for users in three different environments - school, academic and public libraries.

The problem addressed in this research is the complex sense-making process of users in an information search over an extended period of time, particularly changes in thoughts and feelings as a search progresses. The work is in the tradition of Belkin's anomalous state of knowledge, Taylor's levels of information need, and Dervin's sense-making.

Personal Construct Theory (PCT) was used as a basis for this research. An information search was viewed as a process of construction in which users move from an anomalous state of knowledge to understanding. Early stages, when thoughts are unclear and vague, are characterized by uncertainty and confusion, with anxiety building until the person forms a focus or point-of-view that moves the process along to completion. The later stages are commonly characterized by increased confidence and interest. The current study verified the Kuhlthau Model in a larger, more diverse sample of library users.

Findings indicate that thoughts about a topic become clearer and more focused as one moves though the search process, seeking more relevant and pertinent information. Feelings accompanying these changes matched those predicted in the Kuhlthau Model with confidence steadily increasing. Uncertainty, confusion, and frustration decreased and feelings of being satisfied, sure, and relieved increased during the search process. Participants' perceptions of the search task, however, often did not match the cognitive and affective symptoms predicted by the early stages of the Kuhlthau Model.

The education phase of the project provided means for infusing the findings into practice. Activities along these lines included the development of an Institute to introduce practicing librarians to the process model and its implications, and the design of learning modules which can be incorporated into Masters of Library Science (M.L.S.) programs. Both of these activities are intended to be part of the ongoing program at Rutgers and can be replicated in other institutions of library education. In addition, a Symposium has been planned for scholars who are actively involved in this field of research.

CHAPTER 1: INTRODUCTION

BACKGROUND

Traditionally, libraries and other information systems have been source- and technology-driven. This has tended to obscure the complex sense-making process of the users of these systems. The user's process within an information search affects access to information as much as do the sources of information and the technology of the system. Attention needs to be given to the experience within the search process viewed from the user's perspective as an essential element in facilitating access to information [1].

Study of changes in the user's thinking as a search progresses falls within the cognitive realm of information seeking behavior [2,3,]. A search begins with an anomalous state of knowledge and moves toward understanding [4]. The user forms new constructs while seeking and using information, which result in shifts in thinking and changes in the state of the information problem. Cognitive changes within an information search may also be associated with the affective symptoms which are commonly experienced in the process of construction.

Personal Construct Theory (PCT) describes construct building as evolving through a series of phases which involve the emotions as well as the intellect [5]. At the first encounter with a new experience or idea, the typical person is confused and anxious. This state of uncertainty increases until the person reaches a threshold of choice where the quest to find meaning is either abandoned or a hypothesis is formed which moves the process along to confirm or reject the new construct. PCT explains all learning in this way [6]. The person searching for information to address a problem is in the process of construction. Viewed within PCT, one would expect both the affective and the cognitive experience of information use to influence, and be influenced by, information-seeking behavior.

During a search for information, the user is involved in forming new constructs and altering those previously held. The anxiety experienced by users of libraries and databases is well documented. For the most part apprehension and anxiety have been attributed to a lack of familiarity with the system, particularly in relation to sources and technology. In light of PCT, anxiety may be a natural and integral part of the information search process.

Cognitive and affective aspects of the information search process in libraries were explored by Kuhlthau in earlier qualitative and longitudinal studies of a small, specialized group of library users [7,8,9]. In the earlier studies, common patterns in the experience of participants were noted which could be articulated and documented. While the pace of a search varied among individuals, certain aspects in the experience and the sequence remained relatively constant. Students' feelings about themselves, the library, the task, and the topic changed as their understanding of their topic deepened. The critical point of the search process (the turning point when the subjects shifted from uncertainty to confidence) frequently was associated with forming a focus, defined as a personal point of view,

about a topic. The focus was evidence of cognitive movement toward sense-making. Failure to form a focus within the search process often resulted in difficulty in writing because a personal understanding of the topic had not been achieved. In such cases, little or no shift in feelings was noted. A model of the search process was developed from these findings, incorporating affective experience with cognitive movement.

The Kuhlthau Model of the search process, shown in Appendix 1, supports the phases of construction described in PCT. The search begins with a vague, general topic and a feeling of apprehension and uncertainty. As the searcher becomes more sure of the topic there is a brief sense of optimism. This is followed by what participants found to be the most difficult part of the process, when the information they encountered did not fit neatly with what they already knew. At this point, a focus or personal perspective serves to move the search on, in much the same way as the hypothesis does in PCT. After a focus has been formed, the searcher proceeds more confidently with a sense of direction. The focus provides a sense of ownership characterized by increased interest. The thoughts during the process move from ambiguity to specificity, and decisions move from determining relevance based on general public knowledge to seeking pertinence [10] based on a personal understanding of the topic.

An extended model of the search process was developed for each of the six stages. The task was described along with the thoughts, feelings, actions, and helpful strategies as well as the mood found to be most productive. The strategies of talking, writing, and thinking seemed to be as important to students as the actual sources they used. The concept of mood as being either invitational or indicative was adopted from Kelly's Personal Construct Theory. An invitational mood would foster an open search, ready to take in new information. An indicative mood would lead to an approach seeking closure.

The first stage was task initiation represented in Appendix 2. When the students in the earlier studies received the assignment, they expressed feelings of uncertainty and apprehension. They needed to prepare for the decision of selecting a topic by understanding the assignment and relating it to prior experience.

The uncertainty continued until a topic was selected, which was identified as the second stage of the process depicted in Appendix 3. If a topic was not chosen quickly, apprehension increased. When a topic had been selected, a sudden feeling of optimism was commonly experienced.

A third stage involved exploring information on the general topic for a focus shown in Appendix 4. For many of the students this was the most difficult stage of the process. As they found information on their topics, they frequently became confused by the inconsistencies and incompatibilities they encountered, exactly the type of reaction PCT would anticipate. For some the confusion became so threatening that they wanted to drop their topics. This is also an expected reaction according to PCT.

Focus formulation, identified as the fourth stage, is depicted in Appendix 5. For many students this was the turning point in their research. When students did not form a focus during the search

process, they commonly experienced difficulty throughout the remainder of the assignment. A clear focus had to be formed at this stage in the search process to enable students to move on to the next stage, as a hypothesis moves along the process of construction.

The fifth stage, involving collecting information on the focus, is represented in Appendix 6. Students described a sense of direction and feelings of confidence. Many students reported that their interest increased in this stage.

The last stage, shown in Appendix 7, is the conclusion of the search for information and the starting phase of the writing process. Students revealed different reasons for closing a search. Some ended when they encountered diminishing relevance. Another consideration was redundancy. Some concluded the search when they felt they had put forth sufficient effort. Students were aware of time constraints and closed the search near the date the assignment was due.

RELATED RESEARCH

Research on the interaction of users with information systems is on the rise. Belkin and Vickery [11] provide a comprehensive review of the research and urge more studies on specifically defined aspects of interaction. There is evidence of a critical shift in paradigm from emphasis on systems from the systems' perspective to study of users' problems from the users' perspective [12].

Studies of Cognitive Aspects of Information Seeking

Research in this area is in an exploratory stage with questions emerging for further investigation. Saracevic and others [13] have found that two elements of users's perceptions bear distinct relation to search outcomes. These are the users' definition of the underlying problem and the users' estimation of the contents of the system related to the problem.

How users' knowledge structures cope with the structure of the system were studied by Ingwersen [14]. He used a thinking-aloud technique combined with observation to measure user interaction with document organization, user-librarian negotiation, and librarians' search processes. Findings indicated that an open rather than closed search may allow users to extend conceptual knowledge structures (in order to learn) within the search process. Searchers' expectations were also found to affect search outcomes. Using a similar hypothesis, Dewdney is investigating neutral questioning based on the theory of sense making. Neutral questions are, "open in form, avoid premature diagnosis of the problem and structure the interview along dimensions important to users" [15].

Ford's study [16] focused on what may be going on in an individual's mind when perceiving that a problem requires information. He found that behind ostensibly similar library activities - using catalogs, borrowing items, and requesting services and information - were very different mental states and processes.

A number of studies have begun to assess individual differences that may affect search processes. Bellardo [17] found a correlation between GRE quantitative scores of graduate library students and search performance, but no correlation with GRE verbal scores. Woefl

[18] found that a sample of skilled MedLine searchers studied clustered in the "high active, high abstract" learning style of the Kolb Learning Style Inventory. Cognitive attributes correlated with search process but not with search outcome.

In a study to investigate why people have difficulty using online catalogs, Borgman [19] found that undergraduate social science and humanities majors performed less successfully on a benchmark test than did science and engineering majors. Also, high library use did not in itself provide any advantage in using online systems.

These studies indicate that cognitive attributes may affect the search process. Users' expectations of the system and the search process may influence the way they approach information seeking, and therefore affect their access to information.

Studies of Affective Aspects of Information Seeking

A number of studies have found uncertainty and apprehensions present in users of libraries and online systems, particularly at the beginning of a search. While these studies are of small samples, findings indicate that apprehension may be commonly present in the search process of users.

Fleming [20] studied the information behavior of first year undergraduates. Assuming that users' perceptions produce the psychological state that leads to information seeking behavior, the study was concerned with understanding students' behavior from their frame of reference. He found that although the students were apprehensive and confused about the assignment from the beginning, they did not seek clarification from the instructor or assistance from the library staff. Also, they were unable to formulate questions to aid problem solving, had limited knowledge of sources, and lacked ability to analyze, synthesize and evaluate information. In another study set in an academic library, Lederman [21] also found that apprehension associated with communicating information problems negatively affected acquisition of information.

Using ethnographic techniques, Mellon explored the feelings of students about using the library for research [22]. She found that 75 to 85 percent of the undergraduates described their initial response to library research in terms of fear. The term "library anxiety" was coined to describe this state of uncertainty and apprehension at the beginning of the search process. She found that students generally felt that their own library skills were inadequate and in an attempt to hide their inadequacy did not ask questions of the instructor or the library staff.

These studies indicate that uncertainty and anxiety are commonly experienced at the beginning of the search process and that individual users perceive this to be solely due to their own inadequacy rather than an experience shared by other users. This perception may limit access to information by inhibiting productive search behavior, such as employing expert assistance, tolerating uncertainty, and using the system to form new constructs.

Cognitive Models of Information Seeking

The models described below are selected for their match with the Kuhlthau Model. Models presenting a mechanistic, source approach are not included.

Taylor's levels of information need provided a model associated with users' questions ranging from visceral, conscious, formal, to compromised [23].

The research of Belkin and his colleagues [24] centered on information problems and the interaction of the user from an anomalous state of knowledge to specificity. Among the functions of system interface identified in this work is the state of the user's problem throughout the course of a search for information.

The sense-making model, based on the work of Dervin and her colleagues [25], describes information seeking as a sense-making process initiated by a situation causing an information gap and calling for a new sense of something. In this model all information seeking is seen as a movement over time and information itself is viewed as a construct of the user. Information seeking involves the meaning individuals make in order to progress through a situation causing an information gap.

The model underlying Personal Construct Theory (PCT) is particularly useful at this point in the study of information seeking. PCT has been applied to research in many disciplines frequently using repertory grid techniques [26]. Recently it has been applied to the study of expert systems [27]. The cognitive and affective characteristics associated with the phases of construction offer a frame of reference for examining the sense-making process of information seeking and the experience of the user within an evolving problem state.

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CHAPTER 2: ACTION PLAN

PROJECT GOAL

The overarching goal of this study was to initiate a change in the traditional focus of information provision in libraries from a source- and technology-driven orientation to a process-driven one. This goal would be achieved by infusing cognitive models of the search process into research and education. To provide the initial funding to accomplish this goal, Rutgers University's School of Communication, Information and Library Studies (SCILS) was funded $93,553 over a 14-month period, October, 1987 to November, 1988, from the United States Department of Education, Library Programs, Office of Educational Research and Improvement (OERI).

OBJECTIVES

The objectives for the project were:

1. To validate a model of the search process that is generalizable to users in all types of libraries.
2. To test the model as an intervention method capable of facilitating:
    a.) the identification of information seekers' information needs, and
    b.) the formulation of appropriate search strategies to assist in that process.
3. To diffuse research innovation about information seeking through the participation of librarians in the model's development, testing, and in the educational activities that follow.
4. To infuse into the M.L.S. program appropriate education modules on the search process, gained from research and development, enabling librarians to enter practice capable of diagnosing and responding more effectively to varying levels of information need.
5. To formulate the model and strategies delineated by the research and development into a Workshop and an Institute to be offered to librarians as continuing education through the SCILS Professional Development Studies program, and to sponsor a Symposium to stimulate further research.
6. To provide formative and summative evaluations of the research and education efforts undertaken.
7. To disseminate information about:
    a.) the significance of the model for information provision and education, and
    b.) the activities which the research and development spawns.

PLAN OF ACTION

To verify the Kuhlthau Model of the information search process which describes cognitive and affective changes experienced by information seekers, to test its value in the field, and to recommend its infusion in M.L.S. education, the research team conducted a study and developed a series of dissemination and education activities. A

timeline of events was agreed upon, in order to accomplish the extensive and diverse objectives of the project.

The research team consisted of:

Dr. Carol C. Kuhlthau	Principal Investigator
Dr. Betty J. Turock	Project Director
Mary W. George	Academic Library Coordinator
Jana Varlejs	Director of Professional Development
Robert J. Belvin	Research Associate
Margaret Austin	Administrative Assistant
Jacqueline Boss	Research Assistant
Bonnie Kunzel	Research Assistant
Dr. Nicholas Belkin	Research Advisor
Dr. Tefko Saracevic	Research Advisor
Dr. Lea Stewart	Research Advisor

The team held weekly work sessions throughout the 1988 Spring and Fall semesters with larger blocks of time set aside to concentrate on particular parts of the project as deadlines approached. Assignments were made during the work session which individual team members accomplished and shared at team meetings.

One of the first tasks of the research team, in preparation for collecting data for quantitative analysis, was to modify the instruments used in the earlier studies. The Perceptions Questionnaire and Flowchart were adopted as originally designed. The Process Survey was changed from all open-ended questions to a combination of open-ended questions, scaled responses, and choices of selection. In order to measure the Kuhlthau Model more precisely, a confidence scale was added, as were four questions with choices for selection taken directly from the model.

Another early task was to select the libraries that would participate in the study and to issue invitations. Eight academic, public, and school libraries were selected with the expectation that at least six of each type would be able to complete collection of data. Of the original twenty-four, twenty-one were able to participate to completion.

Planning and conducting the training Workshop for librarians from each site was next on the agenda. Intensive preparation took place during the second through the fourth months for the workshop to be presented early in the fifth month.

The Workshop was followed by three months of data collection. While the data were being collected, the team refined methods for analysis. During the eighth to eleventh months, while the research assistants entered the data, the team reviewed and analyzed preliminary findings in preparation for making a final analysis.

The Institute took intensive planning and preparation. The Professional Development Office assisted in arrangements which included providing room and board; designing, printing, and distributing a brochure; publicizing the event nationally in

professional association journals and newsletters; and inviting library educators to be observers. Syllabi, reading lists, schedules, activities, evaluation instruments, and advance instructions for attendees were developed by Carol Kuhlthau and Mary George during three months prior to the Institute. The Institute was offered, critiqued, adapted, and evaluated in June.

Learning Modules for incorporation into M.L.S. programs were designed in May, piloted in Summer and Fall courses, written in final form in the twelfth and thirteenth months, and reviewed by the Rutgers M.L.S. Courses of Study Committee.

A Symposium for researchers was planned in the twelfth and thirteenth months to be held at Rutgers School of Communication, Information and Library Studies in February 1989. Preliminary findings were presented at the American Library Association Annual Conference 1988 and at the American Society for Information Science Annual meeting in October 1988. Other papers about the project have been presented in October 1988 and November 1988 and are scheduled throughout 1989. Articles in appropriate journals will follow each presentation with additional publications planned throughout 1989.

Evaluation was made of each element as the project progressed and is reported in the corresponding sections of this document. Summative evaluation was made in the fourteenth month as is reported in Chapter 6. This report of the project was prepared for the United States Department of Education in the fourteenth month.

TIMELINE OF PROJECT EVENTS

Activities	Months
October, 1987 (1) - November, 1988 (14)	
1. Modify pilot instruments.	1-4
2. Select sample of libraries.	1-3
3. Plan and conduct training Workshop for librarians.	2-5
4. Data collection.	6-9
5. Data analysis.	9-12
6. Set up Institute mechanics.	6-8
7. Prepare Institute syllabi.	7
8. Offer and evaluate Institute.	9
9. Write and submit articles to refereed journals	9-

10. Develop and test M.L.S. learning Modules.	8-13
11. Plan Symposium for researchers.	12-13
12. Present papers at professional meetings.	9-
13. Summative evaluation.	12-14
14. Write and submit report.	13-14
15. Major publications and presentations.	12-

Table 1

CHAPTER 3: RESEARCH PHASE

PROBLEM STATEMENT

To determine whether Kuhlthau's Model, developed from school library investigations, is generalizable to users of other types of libraries, it was tested on a broader population in school, academic, and public libraries. Users' perceptions of the search process were investigated along with their experience during an extended search for information. Perceptions of the role of mediators - peers, experts, and the system - play in the search process were examined.

The information search process, as defined for this research, has two essential components: 1) it takes place over an extended period of time, and 2) it culminates in some kind of presentation, either oral or written. The process also has both a distinct initiation point and a definite point of closure. A single reference query does not fall within this definition of the information search process. The concept of process presumes intensive involvement over a period of time. Users' perceptions of the search process become cognitive models or maps which reveal expectations prompting their search behaviors.

The results of the earlier study of a small sample of library users, 25 college-bound high school seniors, suggest that the affective symptoms associated with construct building may be a natural part of the information search process and commonly experienced by searchers. Subsequent longitudinal studies of these same students four years later, when most had completed four years of college, further confirmed the hypothesis that users in all types of libraries may experience a process similar to that described in Kuhlthau's Model. This model needed to be tested with a wide range of users in different information environments.

The earlier qualitative and longitudinal studies provided a window into the user's experience within the search process. They offered deep description of a new problem by providing many layers of data collected over an extended period of time for the purpose of developing a grounded theory. The research hypotheses and process model generated in the earlier studies required testing using quantitative methods on a larger, more diverse sample of library users in order to validate and generalize the findings.

RESEARCH QUESTIONS

The general research question addressed in this study was: Does Kuhlthau's affective and cognitive model of the information search process, as developed in an earlier study, hold for a large, diverse sample of library users? Specific questions examined as part of the general question were:

1. What are the cognitive models of the search process which users hold before, during, and immediately after an extended information-seeking project.
2. Do these cognitive models have process elements, or are they solely source- and technology-oriented?
3. What affective symptoms are associated with what cognitive states at each of the stages of an information search?

4. What are users' perceptions of the role of mediators in their search process?

5. Is there a significant difference in the cognitive models and corresponding affective states among school, academic, and public library users engaged in extended information searches?

RESEARCH METHOD

The present study, funded by the U.S. Department of Education for $93,553, involved testing library users in three types of libraries, analyzing their perceptions of the search process and their experience in the course of an extended search.

The field study was facilitated by a Workshop to train the librarians from each site to collect the data. The Workshop also served to involve practitioners in the research in order to foster the diffusion of innovation from research to practice as discussed by Turock. [28]

Data collection covered a 12-week period beginning in March and ending in June 1988. The librarians from each field site selected users who were at the initiation of a library project which would be completed before June 1, 1988. They administered three instruments at designated times and no treatment was given. They kept journals of their contact with each participant in order to substantiate application of uniform data collection methods.

[28] Turock, B. (1983). "Public Librarian: Research Consumer." Public Library Quarterly 3, 3-8.

TRAINING WORKSHOP

Twenty-one field sites - located in school, academic, and public libraries in New Jersey - were chosen on the basis of their location, size, receptivity to innovation, and willingness to participate in all phases of the study. While all of the sites were within New Jersey, the sample included libraries of varying size dispersed in fourteen counties across the state. In the final sample there were eight school, seven academic, and six public libraries.

To initiate this research project a two-and-one-half day, thirty-hour residential Workshop was conducted for one or two librarians from each of the twenty-four participating sites listed in Appendix 8. The Workshop was intended to introduce these librarians to the model and its new approach to facilitating information seeking, and to ensure uniform data collection. The method used to accomplish these objectives was for the librarians to replicate the experience of users in the search process, to reflect on their experience, and to consider how it might affect their interaction with library information seekers.

The Workshop was held February 4-6, 1988, at the TraveLodge in Somerset, New Jersey; for a schedule of events, see Appendix 9. Participants were asked to come with a topic of personal interest about which they would collect information and present a five-to-seven minute talk to the entire group on the final evening of the Workshop - as described in the letter of preparation to participants in Appendix

10. After an initial presentation by Kuhlthau of the search process model and its development (see Appendix 11 for accompanying bibliography), the librarians gathered information on their topics in three two-hour sessions in Rutgers's Alexander Library, followed by small group discussions and large group debriefing sessions. The discussions and debriefings were confined to the cognitive and affective aspects of the search process as the participants experienced it; specific sources were mentioned only as they related to the process. Following are the librarians' comments recorded from the debriefing sessions at three points in their searches:

Initiation

Disoriented in library
Panic at time constraints
Fluctuating confidence
Elation at focusing
Panic over location
Fear of returning volumes
Copying problems
Mad at online catalog - No subject approach
Sources British
Person asked to help could not
Reference books not on shelves
Confidence dropped in new library
Browsing technique
Need to expand on narrow topic
Frustration at not finding specific information
Anxiety about requirements of assignment
Satisfaction with mediators
Signage reassuring
Difficult to identify librarians
Uncertain at start
Overwhelmed by number of sources
Plough through now
Upset at things in unfamiliar setting
Reschooling self
Moment of elation when finding pertinent article
Get back into patrons' frame of mind - do not want to look foolish
Ego (among other professionals)
Overwhelming if you have no idea where to start
Frustration and panic
Lines of people at indexes (Infotrac)
No sign to Infotrac
Confusion over task
Uncertain how to use information found

Midpoint

Liked library atmosphere today
Confident on topic selection
What material found is satisfactory, but some material is not available

Anxiety over product
Optimistic, feel better about Alexander - Confident Literature not exhausted but still have enough What is enough?
More interested but also sidetracked
Frustration in strange library
Anxious regarding questions about product, do we cite?
More confident regarding topics - some narrowed, some expanded
One particularly relevant source- not found (just identified) yesterday
Enough - narrowed time coverage
Time to think wanted between research and product
Tracking down pertinent information - not thought to be so yesterday
Anxious about presentation
Alexander librarians were very accommodating - "waited on hand and foot"

Closure

Relief
Structural problems - not relieved yet
Internalized concept but no final outline yet - still narrowing - small parts to amplify
Exploring was interesting/sources not always so once collected
Confirmed initial hypothesis about how much exists
Library snafus - books disappeared
More could be done - will pursue further
Could eliminate some things from original plan
Feeling need to read and digest more
Gained new insight into topic
Apprehensive about pulling things together
Uncertainty about task
Missing sources - here yesterday, gone today
Summary search/evidence of redundancy
Lots more questions and interesting issues
No relief because task not complete

On the final morning of the Workshop, the librarians participated in role-playing designed to reinforce their ability to implement the search process model. The participants, joined in some cases by a colleague who could serve as a backup during the data collection phase, were given instructions for participating in the study. Each received a packet of instruments with written directions on collecting data. Mary George noted the questions asked during the session and the answers given by the team, as shown in the minutes of discussion of data collection procedures in Appendix 12.

During their information seeking, librarians used the same research instruments that they would later administer to the on-site user participants: a questionnaire to elicit perceptions before and after the search process; plus Initiation, Midpoint, and Closure Surveys to capture the process they were experiencing at each point, shown in Appendix 20.

Librarians' responses on the questionnaire were analyzed to determine if the training in the Workshop appeared to make a difference in their perceptions of either informaton seeking as a process or the role of mediators in that process. The librarians, a experts, were expected to score high on the questionnaire administere before the search, but subtle shifts were anticipated in their responses after the search, indicating changes prompted by their experience in the Workshop. Owing to this population's specializati and small size, data were subjected to descriptive statistics only, shown in Appendix 13 and 14.

The Perceptions Questionnaire verified the librarians as an expert audience. Seventy-one percent of the librarians' responses followed a pattern which would have been predicted by the model. Th questionnaire revealed changes on four questions toward the response expected from the model. Question 7, "The information I find at the beginning of a search is confusing and doesn't fit in with what I know," had a shift from "Seldom" to "Often." Question 18, "I ask th librarian for assistance in identifying materials," shifted toward "Almost always." Question 1, "I have a clear focus for my topic before using the library," and Question 8, "I take detailed notes f every source of information I look at," had similar shifts in the other direction.

Questions 1 and 7 revealed perceptions which confirm the compl act of sense-making and construction which is at the core of the information process presented in the model. Responses to Question indicated a strategy (taking detailed notes) which may inhibit the process at certain points at early stages when reading for general ideas and themes is more appropriate. Analysis of Question 18 revealed an expanded role of the librarian as mediator from that of mere locator (as indicated in Question 9) to one of assisting users identify materials.

The Perceptions Questionnaire revealed librarians to be an exp audience with an awareness of the process of an information search. The questionnaire showed that the Workshop affected a shift toward model in perceptions of both the process of information seeking and the role of the librarian as mediator. Although no further analysi was made on this group and it is not part of the larger data set, these findings support the objective to infuse theory into practice

An evaluation of the Workshop was conducted by Jana Varlejs. Most participants responded that they were "fairly well" prepared t fill their role as data collector for the research project. Twenty- five of twenty-six responded that the Workshop had changed their perception of what the library user experiences during the informa seeking process "a lot" or "somewhat" (Appendix 15). Additional evaluation comments in Appendix 16 show the librarians' enthusiast endorsement of the residential Workshop.

The Workshop also accomplished the primary goal of familiariz the participating librarians with the research instruments and procedures to ensure uniform data collection. This was particular important in the field study using practioners in a working environment over an extended period of time. It was essential for them to understand fully the data collection methods. It was also

helpful for them to have an overview of the total project and some commitment to following through to completion. The librarians were responsible for selecting the sample, administering the instruments, and returning accurate data sets, and the project was dependent on their ability to do so.

STUDY SAMPLE

The librarians from each field site selected users who were at the initiation of an extended library project which would be completed before June 1, 1988. Up to thirty information seekers were selected by the librarians at each location on the basis of the suitability of their information problem and their willingness to participate in the study. Only research- level questions which would be completed within the time of the study were considered.

Of the 385 library users who participated in the study, 59% (229) were from school library media centers, 28% (108) were from academic libraries, and 13% (48) were from public libraries, as shown in Appendix 17. The public library users proved to be the most difficult to identify. Although the research team was pleased to have 48 participants, further study of the population is needed.

Responses to a participants' profile (Appendix 18) show that, males made up 41% of the participants and females 59%. Seventy-three percent were under the age of 20, 10% between 20 and 24, and 17% were over 24 years old. In some cases, participants from academic libraries were older, nontraditional students which accounted for part of the 17% over age 24; the remaining members of this group were public library participants, as shown in Appendix 19.

INSTRUMENTS

Three instruments were used to collect data, Process Surveys, Perceptions Questionnaires, and Flowcharts. Each had been pilot tested in a prior study. The Process Survey consisted of nine questions, four open-ended, one for scaled responses, and four multiple choice.

The Process Surveys, designed to elicit cognitive and affective aspects of the information search process based on the Kuhlthau Model, were administered to each of the participants at three points - Initiation, Midpoint, and Closure - in their search, shown in Appendix 20. The first three questions allowed free responses in eliciting constructs about the topic and level of information being sought. The fourth question was also open-ended, calling for identification of mediators throughout the search process. The fifth and sixth questions related to the affective aspects of the process. The fifth was a scale of confidence, and the sixth listed the affective adjectives from the Kuhlthau Model for participants to select. The last three questions listed tasks, thoughts, and actions within each stage taken from the model for unlimited multiple choice selection. The seventh question requested participants to select one answer and the eighth and ninth questions directed them to select as many responses as applied.

Users' perceptions of the search process and of the role of mediators were tested by a Perceptions Questionnaire administered

before and after the search, shown in Appendix 21. Statements on the Perceptions Questionnaire were based on characteristics of process orientation as defined in the earlier study. Of the twenty questions, ten were related to process and ten to the role of mediators. A four-point Likert Scale of "almost always," "often," "seldom," and "almost never" was supplied for respondents.

Participants were asked to draw cognitive models of the search process in the form of Flowcharts at the beginning of their search and again after they had completed their search, as shown in Appendix 22. The Flowchart instrument consisted of a single sheet with the instructions, "Make a flowchart of your library search by connecting boxes." A box labeled "Initiate Project" was placed at the top left and another labeled "Information Search Completed" at the lower right.

DATA ANALYSIS

Data from a subgroup of 169 participants at 11 sites were entered and analyzed in May and June. A paper based on this preliminary analysis was then prepared for inclusion in the proceedings of the 1988 American Society for Information Science annual meeting. Data from the remaining respondents were entered during August 1988. The following description represents the full data from all 385 participants in the study.

Data Entry

Data entry was via a spreadsheet (LOTUS 123) and a keyboard macro program. The approximately 220 variables and 385 cases produced a data matrix of 85,000 cells. Owing to the size of this matrix, a series of spreadsheets were produced. The rows of the spreadsheets were the cases and the columns the variables. After preliminary cleaning, ASCII data files were produced. These ASCII files were combined and received minor editing using a word processing program (WORDSTAR 4.0). The combined ASCII files were then analyzed, first by using SPSSPC+, and later with SPSSPC 2.0. This somewhat roundabout approach permitted extensive formatting and data cleaning before the data were entered into SPSSPC. The preliminary work was facilitated by the column-and-row approach of the spreadsheet and by the global search and replace functions within the word processing program. (Note that the analysis could have been performed using SPSSPC 2.0 exclusively had its data entry and editing module been available to us at the start of the data analysis.)

After data were entered into SPSSPC, additional "possible punch" and contingency cleaning was performed. "Possible punch" cleaning revealed whether minimum or maximum values of any variable had been exceeded. An example was gender, where male was coded "0", female was coded "1" and a missing value indicated no response. If the maximum value was "2" or greater, the input data were examined for error.

Contingency cleaning was done by creating contingency tables and examining them for impossible combinations. For example, a contingency table of site-by-education level revealed that one respondent at a high school had been described as having a college degree, an obvious coding or input error.

Coding

The open-ended questions on the Process Survey were coded by the principal investigator for analysis. Questions 1-4 were coded into the following categories:

Question 1: "What are you looking for?"
0 = Other (Haven't started or completed search)
1 = General Information (Background)
2 = Specific information (Relevant)
3 = Pertinent Information (Focused)

Question 2: "Describe the topic in a short paragraph."
1 = General Topic
2 = Narrowed Topic
3 = Focused Point of View

Question 3: "What is the title of your project?"
0 = No Title Yet
1 = Vague Concise Expression
2 = Clearer Concise Expression
3 = Focused Concise Expression

Question 4: "Who have you talked to about your project?"
0 = No one
1 = Other (Friend, Family Member)
2 = Peer (Person also doing project)
3 = Expert (Person who knows about topic)
4 = Professional (Person who knows about sources)

Since multiple selections were possible for this last question, combinations were coded with the decimal equivalent of a five-digit binary number. For example, the combination of "Peer" and "Expert" was entered as 12 (Binary 01100) and the combination "Professional" and "Other" was entered as "18" (Binary 10010). This coding scheme permitted the entry of all possible combinations as two digit numbers. Obviously, all output had to be interpreted and rearranged for clarity.

On Questions 6, 8, and 9, multiple responses were possible. Given the number of possible choices - over 4000 possible combinations for Question 6; 250,000 combinations for Question 8; and 2,000,000 potential combinations for Question 9 - binary coding was not possible. Hence, each item within these questions was entered as a separate variable where "1" showed that the item had been selected and "0" that it had not been selected. A missing value represented a non-response to that question.

Question 7 was coded from 1 to 7 to represent the single choice requested in the question. Responses with multiple answers were coded as a missing value, "8". Multiple responses were not recoded for separate entry.

Data Structure

The Process Survey data from Questions 1 to 4 and from Question 7 were categorical. Question 5 required an interval scale. Questions 6, 8, and 9, which yielded sets of dichotomous variables, were treated as interval-level data.

Items on the Perceptions Questionnaire constructed on a Likert Scale ranged from a minimum value of 1 (Almost Always) to a maximum of 4 (Almost Never). The mean of each item was 2.5.

The five questions on the Perceptions Questionnaire which were written to elicit an ideal response of "almost never" rather than "almost always" in format were inverted for coding and analysis. These questions were "I have a clear focus"; "I like to find everything first and then read it"; "I take detailed notes..."; "All the sources of information I need are in the card catalog"; and "A search is completed when I find enough information".

During preliminary analysis the responses to the Perceptions Questionnaire were collapsed into a dichotomous nominal variable as either matching the anticipated response or contradicting the anticipated response. Later, additional analysis was performed on these responses as ordinal, assumed-interval data.

Analysis

The first stage of the data analysis consisted of producing univariate descriptive statistics including frequency distributions and measures of central tendency.

The analysis of the Process Survey Questions 1 to 4 was limited to the construction of contingency tables and Single Sample Chi Square Tests.

Question 5, the confidence scale, was analyzed using Paired T-Tests between the Initiation, Midpoint, and Closure responses. Although an ANOVA for these repeated measures would have been preferable, the appropriate SPSSPC module was not available, thus dictating this approach. The probability of spurious significance was acknowledged and care was exercised to treat these results with extra caution.

T-Tests were performed on aggregated data by site and as repeated measures on each variable from Questions 5, 6, 8, and 9. T-Tests were also performed on the responses on the Perceptions Questionnaire, both on the aggregated data by site and as repeated measures. In each instance where a T-Test was performed, the more conservative Separate Estimate of Variance was used. Also, whenever possible, the Paired T-Test was used. A two-tailed probability of significance was used.

ANOVA analysis was performed on variables aggregated by site and the Scheffe Test was used to indicate significant differences between group means. The Scheffe Procedure was chosen as a conservative test.

It was decided to treat the nominal-level data of items selected in Questions 6, 8, and 9 as assumed-interval data. However, in keeping with the actual measures involved, Chi Square Tests were performed whenever any analysis of difference by group was done, using interval tests such as T-Tests and ANOVA. The use of interval-level tests on this data violated the mathematical assumptions for the procedures, but was in keeping with the utility of the measures. The same caveat

regarding the use of repeated measures, as described for Question 5, was applied to these questions.

The mean of the variables for Questions 6, 8, and 9 is equal to the percentage of respondents selecting that item. In much of the analysis, this percentage was used as the key value. It should always be noted that the percentages refer to the respondents who selected that item, not to a percentage of the total responses to the question.

Future work will be done on the content analysis of the Flowcharts to relate respondents' cognitive changes to the various stages of the search process. The authors hope to present those findings at the 1989 American Society for Information Science annual meeting. Flowcharts will be analyzed for both content and patterns of response.

Presentation-quality graphics and overhead projection transparencies were produced with Microsoft Word 4.0 and a Hewlett-Packard Laser-Jet II printer. In almost all cases, it was necessary to edit substantially the output of SPSSPC so that informative and concise data presentation could be achieved. In a number of instances, the SPSSPC output was routed to a disk file and that disk file was edited with WORDSTAR 4.0. The edited files were imported into Microsoft Word 4.0 to take advantage of the text and page formatting features of the latter program.

RESEARCH RESULTS

The data were analyzed to verify or refute the Kuhlthau Model with the entire sample and then to determine significant differences by type of library.

Process Survey Results

The Process Survey was administered at three points - Initiation, Midpoint, and Closure - and responses at each point were compared. The first three questions elicited cognitive aspects of the search process.

Responses to the first question, "What are you looking for?" elicited the level of information being sought at each of the three points in the search. These open-ended responses were coded in four categories: general information (seeking background on the general topic, for example, consulting encyclopedias and other general reference materials); specific information (seeking relevant information on the topic, for example, consulting specific reference sources or circulating books); pertinent information (seeking information focused on a particular aspect or perspective of the topic, i.e., certain chapters of a book or articles); or Other (i.e., haven't started, have already completed search).

At Initiation, 81% of the respondents said that they were looking for background information, 9% were seeking relevant information, 10% indicated that they had not started their search yet, and none was attempting to find pertinent information on a focused aspect of their topic as shown in Appendix 23.

At Midpoint, 70% of the respondents indicated that they were looking for relevant information, with only 19% seeking background information on the general topic. Four percent were seeking pertinent

information at that time, and 7% gave other responses indicating they either had not started on the one hand, or that they had completed their information search.

At Closure, 54% of the responses fell within the "other" category, indicating that those respondents had completed their search and were writing or otherwise preparing to present their project. At this point, 25% of the respondents indicated that they were seeking information pertinent to a focus, 17% were looking for relevant information on a general topic, and 4% were still seeking background information as shown in Table 2. The six stages of the model have been compressed into the three points. Stars indicate the participants' selection patterns.

The participants' responses to Question 1 indicated that the level of information sought changed from background to relevant to focused during the search process. However, most participants moved from general to relevant, with a relatively small percentage reporting that they were seeking focused information at Closure. There was no significant difference by type of library.

Table 2

"What are you looking for?" Question 1.
Frequency

	I	M	C
N=	363	312	316
Background	********	*	.
Relevant	.	*******	*
Focused	.	.	**
Other	*	.	*****

Key for Tables 2, 3, and 4:

*******	70% or greater of responses
******	60-69% of responses
*****	50-59% of " "
****	40-49% of " "
***	30-39% of " "
**	20-29% of " "
*	10-19% of " "
.	0-9% of " "

Question 2, "Describe the topic in a short paragraph," sought evidence of changes in the level of thinking or depth of understanding about a topic at the three points in the search process. The open-ended descriptions elicited by this question were coded to identify three levels of thinking: a general topic (vague description), a narrowed topic (clearer description), or a focused point of view (personal perspective).

At Initiation, 71% described a general topic, and 23% showed evidence of narrowing their topic as shown in Appendix 24. By Midpoint, 80% described a narrowed topic. At Closure, 45% revealed a narrowed topic, and 50% had a focused point-of-view on their topic as shown in Table 3. Precisely half of the participants,however, did not make focused statement about their topic at any point during the search process. Again there was no significant difference by type of library.

Table 3

"Describe the topic in a short paragraph." Question 2
Frequency

	I	M	C
N=	341	312	314
General	*******	*	.
Narrowed	**	********	****
Focused	.	.	*****
Other	.	.	.

Question 3, "What is the title of your project?" sought to elicit the participants level of thinking about their topics at three points in the search process. It was similar to Question 2, but this time requiring description in a concise statement. The titles were coded to correspond to the levels of thinking used in Question 2: vague statement of general topic, clearer statement of narrowed topic, focused statement revealing a personal perspective or point of view of the topic. The category of "no title" was added for cases where respondents wrote that they did not yet have a title.

Table 4
"What is the title of your project?" Question 3
Frequency

	I	M	C
N=	336	305	315
No Title Yet	***	*	*
Vague	****	**	**
Clearer	*	****	***
Compromised	.	*	**

At Initiation, 48% of the responses were vague statements of the general topic, and 32% indicated that they had no title yet as shown in Appendix 25. At this point, only 18% made statements of a narrowed topic. By Midpoint, 42% made clearer statements of a narrowed topic, with 29% making vague statements, and 18% having no title. At Closure, 36% made clearer statements of narrowed topics, and 26% made

focused statements. Vague statements were made by 25% at Closure, and 13% responded that they still did not have a title as shown in Table 4. There was no significant difference by type of library using Chi Square.

In summary, responses to Questions 1, 2, and 3 indicate that thoughts about the topic become clearer and more focused as respondents moved through the search process seeking more relevant and focused information. Although there was strong evidence of clearer thinking about a topic as a search progresses, many participants did not make as a focused statement during the search process.

Question 4, "Who have you talked to about your project?" sought to reveal those who are perceived as mediators during the search process. This question may not have revealed who actually was employed as a mediator, but it did show participants' perceptions of who served that function for them. Like the previous questions, open-ended responses were coded. The following four categories were used: Friend or Family member, Peer (one doing a similar task), Expert (teacher, professor or one who knows about the topic), Professional (librarian, one who knows about sources).

Table 5
"Who have you talked to about your project?" Question 4
Frequency

	I	M	C
N=	348	305	315
No One	*	.	.
Family/Friends	*	*	**
Peer	*	*	*
Expert	***	***	***
Librarian	*	**	**

Key for Tables 5 - 10:

*** 30% or greater of respondents
** 20-29% of respondents
* 10-19% of " "
. 0-9% of " "

Responses indicated that 39% of the respondents consulted experts, 25% conferred with librarians, 20% reported using friends and family, and 13% talked with peers, as shown in Appendix 26. Interestingly, there was no significant change from Initiation to Midpoint to Closure, nor was there a significant difference by type of library. Although one might expect that peers would be the most commonly consulted group, few responded that they had done so. Librarians, a group with whom participants in this study had direct contact, were not mentioned in 75% of the responses. A wide range of

experts was mentioned drawing from the community and other contacts as shown in Table 5.

The next question addressed the affective aspects of the information search process. Responses to Question 5, "Indicate your confidence level on a scale of 1 (low) to 10 (high)," revealed confidence steadily increasing with lowest confidence at Initiation, confidence rising significantly at Midpoint, and with another significant increase at Closure, as shown in Table 6 and Appendix 27. Significance was determined using T-Test paired at p=<.05, as shown in Appendix 28.

Table 6

Confidence Scale - Question 5 (%)
Frequency

	I	M	C
N =	361	313	329
1 Low	.	.	.
2	.	.	.
3	**	.	.
4	**	.	.
5	**	**	**
6	.	**	.
7	**	**	**
8	**	**	****
9	.	.	****
10 High	.	.	**
Mean	5.8	6.5	7.6

A difference by type of library using ANOVA (p=<.01) with the Scheffe Procedure showed the public library participants to be significantly more confident at Initiation than the academic or school library participants, as shown in Appendix 29. At Initiation, the academic and school library users indicated the same confidence level of 5.6. The academic participants, however, indicated significantly more confidence at Closure (8.0) than did the school library participants (7.3). Public library users, who reported signiiicantly higher confidence than either of the other types at Initiation, indicated little of no change at Midpoint. While the confidence of the participants in all three types of libraries increased significantly during the search process, the academic participants showed the largest increase in that measure.

Question 6, further addressing the affective elements in the search process, listed ten adjectives, taken from the Kuhlthau Model, from which respondents were asked to select to describe their feelings at Initiation, at Midpoint, and again at Closure. The feelings checked by the participants matched those predicted in the model as shown in Table 7. There was a significant difference between Initiation and Closure for all adjectives, with the exception of

"disappointed" which drew 5% of the responses at Closure, as the model anticipated, shown in Appendices 30 and 31. This figure represents the small proportion of searchers who, for whatever reasons, were dissatisfied in retrospect with how a search had gone. Confidence increased, as did the responses "satisfied," "sure," "relieved." Responses of "confused," "frustrated," and "doubtful" decreased from Initiation to Closure. "Optimistic" was a consistently high selection at each point for participants in all three types of libraries.

Table 7

"From the adjectives below, check those that describe how you feel at this point in the project." Question 6

Frequency

	I	M	C
N [Respondents]=	366	316	328
Optimistic	****	****	****
Confident	***	****	*****
Uncertain	***	**	*
Confused	**	*	*
Other	**	*	*
Frustrated	**	**	*
Satisfied	**	**	****
Sure	*	**	***
Doubtful	*	*	.
Relieved	.	*	****
Disappointed	.	.	.
Total Responses	913	809	938

An ANOVA showed a significant difference in adjective selection by type of library as shown in Appendix 32. Public library users indicated that they were confident at a significantly higher rate than did college or school students. The participants from school libraries indicated that they were more uncertain at Closure and more doubtful at all three points at a significantly higher rate than did those from academic libraries.

In summary, the findings indicate that participants' thoughts about their topics became clearer and more focused as they moved through the search process seeking more relevant and focused information. Feelings accompanying the changes in thoughts matched those predicted in the model, with confidence steadily increasing. Uncertainty, confusion, and frustration decreased during the process, as feelings of being satisfied, sure, and relieved increased.

The last three questions also provided selections taken from the Kuhlthau Model from which participants chose their responses. Question 7, "What is your task now?" sought to elicit the users' perception of their task at Initiation, Midpoint, and Closure. "To recognize an information need" and "to identify the general topic," the appropriate

Initiation tasks according to the model, were not selected by participants at any of the three points in the search process. Midpoint tasks, "to investigate information on the general topic" and "to formulate the specific topic," were selected by less than 20% of the participants, as shown in Appendix 33. Closure tasks, "to gather information that pertains to the specific topic" and "to complete the information search," were selected as the primary tasks at all three points in the search process, as shown in Table 8. These findings indicate that participants' perceptions of the task in the early stages of the search process did not match the state of their understanding of their topics. At Closure, two thirds of the participants had moved out of the search process and into the writing process as shown in Appendix 34.

Table 8

"What is your task now?" Question 7
Frequency

		I	M	C
N [Valid Responses]		323	255	289
Init.	Identify	.	.	.
" "	Recognize	.	.	.
Mid.	Investigate	*	*	.
" "	Formulate	*	.	.
Clos.	Gather Info.	****	***	.
" "	Complete	.	***	**
Other		.	*	******

In response to Question 8, "What action are you taking?" participants again selected from the list of actions at Initiation, Midpoint, and Closure. The actions selected by the participants matched the model generally and changed significantly during the search process.

"Skimming and scanning sources of information," "Discussing the topic," and "Browsing in the library," were all identified as Initiation tasks, as shown in Appendix 35. The frequency of these responses declined significantly as the search progressed. Although decreasing by over 10%, "Skimming and scanning" continued to be identified as an important activity at Midpoint, as shown in Appendix 36. "Reading about the topic" was identified as an important Initiation activity and showed an increase at Midpoint. "Taking detailed notes on facts and ideas" and "Outlining to organize information" were also selected as Midpoint activities which, according to the model, are appropriate actions only after formation of a focus. In the chart in Table 9, the actions are arranged by

Initiation, Midpoint, and Closure according to the Kuhlthau Model. Again, the six stages of the model have been compressed into the three points. Stars indicate the participants' selection patterns which follow the model generally, but which indicate that some actions were considered more important than others, many being used throughout the process as the participants moved toward Closure.

An ANOVA revealed no significant difference between participants in the public and academic libraries, as shown in Appendix 37. The school library participants had a significantly lower mean than did participants from the other two types of libraries in the following activities:

Browsing in the library
Asking librarian questions
Making a comprehensive search
Recording bibliographic citations
Outlining to organize information
Taking detailed notes on facts and ideas
Rechecking sources for information initially overlooked
Writing about themes

Table 9

"What are you doing now? Check as many boxes as apply to you."
Question 8
Frequency

		I	M	C
N [Respondents] =		355	316	326
Init.	Skimming & scanning	*****	****	*
" "	Discussing the topic	****	**	*
" "	Browsing in library	****	*	.
" "	Asking librarian	***	***	.
" "	Preliminary search	***	.	.
" "	Conferring with people	***	**	*
Mid.	Reading about topic	****	*****	*
" "	Comprehensive search	***	***	.
" "	Taking brief notes	**	***	.
" "	Recording citations	**	***	***
" "	Talking about themes	*	*	*
Clos	Outlining to organize	*	****	**
" "	Taking detailed notes	*	****	**
" "	Reading over notes	*	**	**
" "	Rechecking sources	.	**	**
" "	Writing about themes	.	**	***
" "	Summary search			
	Other	*	.	***
Total Responses		1,752	1,572	995

The public and academic participants selected these activities more often and earlier in the process than did the high school participants. Conversely, the school sample revealed less asking and conferring than did the other two groups, indicating a different view of mediators.

The last question on the Process Survey, Question 9, "What are you thinking about now?" sought participants' thoughts about procedure and process rather than their emerging ideas about their topics. Participants selected from a list of thoughts taken from the Kuhlthau Model at the three points in their search process, as shown in Appendix 38. Table 10 illustrates that the participants' selections matched the model in most cases. Their choices, indicated by the stars at the right of the list, reveal a movement from Initiation to Closure in the direction predicted by the model. Significant differences in the means at Initiation, Midpoint, and Closure are shown in Appendix 39.

Table 10

"What are you thinking now? Check as many boxes as apply to you."
Question 9

Frequency

		I	M	C
N [Respondents] =		352	314	326
Init.	Becoming informed on gen. topic	*****	***	.
" "	Comprehending the task	*****	***	**
" "	Ident. poss. areas in broad topic	**	*	.
" "	Choosing the broad topic	**	.	.
" "	Identifying alt. topics	**	.	.
" "	Recalling a previous project	*	*	.
Mid.	Seeking info. on specific area	****	****	*
" "	Gaining a sense of direction	****	*****	***
" "	Getting more interested	****	*****	**
" "	Choosing specific concent. in gen.	***	***	**
" "	Defining my specific topic	**	***	*
" "	Predict. success of possible conc.	*	*	**
" "	Confront. inconsist. & incompat.	*	*	
Clo.	Organizing ideas & info.	****	*****	****
" "	Exhausting all poss. sources	**	***	*
" "	Recognizing ways close project	.	**	****
	Other		.	.**
Total Responses		1835	1582	1065

While participants' selections matched the model generally, s thoughts were granted more importance than others and were found t taking place throughout the process. At Initiation, "Becoming informed about the general topic," was selected by over 50% of the participants. "Seeking information about my specific area of concentration," "Gaining a sense of direction and clarity," "Gett more interested and involved in ideas," and "Organizing ideas and information" were also given attention at Initiation and continue most cases to increase through Midpoint and to decrease at Closur with the exception of "Organizing" which held steady through Clos A recursive process is indicated with various levels of thinking on throughout, gradually moving toward completion.

Again, an ANOVA indicated that there was no significant difference between the academic and the public library participan but that the high school students were significantly different in areas, as shown in Appendix 40. Responses from school participan which showed significant difference at p=<.01 were "Organizing id and information" at Initiation and "Recognizing ways to close" at

Midpoint. The academic and public library participants were thinking about some procedures earlier in the process than were members of the school sample.

In summary, perceptions of task did not seem to match the state of thinking about the topic. Participants responded that their task was "to gather" and "to complete" at Initiation when most were seeking background information on a vague general topic with feelings of confusion and uncertainty. Actions and thoughts about the process matched the model in most cases and indicated a recursive rather than a linear process moving toward Closure.

Perceptions Questionnaire

The Perceptions Questionnaire, a list of characteristics of a process-oriented user derived from the earlier studies by Kuhlthau, indicated that the participants for the most part had a process orientation. Appendix 41 shows responses to the ten questions related to process. The lower the mean, the more closely the responses matched the model characteristics, as shown in Appendix 42. The responses above a mean of 2.5 (those responding "almost always" or "often" on a Likert Scale) have been considered to match the model and those below (responses of "seldom" or "almost never") to conflict, tending to move away from process orientation, as shown in Appendix 43. The five items which were reversed to elicit an ideal response of "almost never" rather than "almost always" have been so identified in the following discussion.

Of the five items related to forming a focus in the search process, three match the model: "I become more interested in a topic as I gather information," "A focus emerges as I gather information on a topic," and "My thoughts about my topic change as I explore information." The two items which move away from the model are, "The information I find at the beginning of a search is confusing and doesn't fit in with what I know," and (reversed format) "I have a clear focus for my topic before using the library."

Of the three items related to perceiving the search process as a learning sequence, one matches the model, "I make several trips to the library to research a topic." One falls at the middle, (reversed format) "I take detailed notes from every source of information I look at." The other conflicts with the model, (reversed format) "I like to find everything I will need first and then read it."

Two items related to perceptions of closure. One matched the model, "A search is completed when I no longer find new information." The other did not, (reversed format) "A search is completed when I find enough information."

The remaining ten items related to perceptions of the role of mediators in the search process, as shown in Appendix 44. Four of the five items that elicited perceptions of the system as mediator indicated that participants held a positive view of the library, as shown in Appendix 45. The items having a mean below 2.5 were: "I need materials other than books," "I am successful in using the library," "The library has the information I need," and (reversed format) "All of the sources of information I need are listed in the card catalog." On the borderline at a mean of 2.63 was "The information I need is in

unexpected places in the library," which may indicate an excessively optimistic expectation of the system, as shown in Appendix 46.

The five items relating to the role of other people as mediators had means above 2.5, revealing a positive view of the involvement of others in the search process. These were: "I find it helpful to talk to others about my topic," "I ask the librarian for advice on exploring a topic," "I ask the librarian for direction in locating materials in the library," "I ask the librarian for assistance in identifying materials," and "I talk to people who know about my topic."

There was no significant difference in the responses before and after the search on the Perceptions Questionnaire. Differences are charted on the table in Appendix 47.

An ANOVA revealed significant differences by type of library, shown in Appendices 48 and 49. The high school participants showed more confusion and less interest than the academic and public participants, as shown in Appendix 50. The academic and public library users responded that they more actively used mediators than did the school participants.

Flowcharts

Users' cognitive models of the search process were elicited by having participants draw two Flowcharts, one before they began their search and another after they had completed it. The intent was to examine how users describe a search when asked to make a visual depiction. By providing only a point of entry, "Initiate Project," and another of exit, "Information Search Completed," the instrument allowed free response in depicting how one gets from one point to the other. However, two limitations were placed on the depictions to assure an element of uniformity of data to facilitate analysis. Limiting the space to the one page provided forced the participant to summarize the complete process. The other limitation was the use of the term Flowchart and the instruction to use boxes, which placed some restriction on format and configuration.

Evidence of process elements is being sought through content analysis of each of the over 700 Flowcharts which are being coded by counting the following elements, as shown in Appendix 51:

Steps
Branched steps
Sources
Terms related to action taken
Terms related to thinking
Terms related to feelings
Terms related to focus
Times mediator was mentioned

In addition, the complexity of the configuration is being coded with 1 representing low complexity, 2 moderate complexity, and 3 high complexity.

The two Flowcharts from each participant will be compared for similarities and differences before and after the search process

experience. Differences by type of library will also be determined. The primary research question is whether the Flowcharts reveal source or process orientation. Preliminary analysis indicates a source-to-process hierarchy in the participants' depiction of a search. The lowest level of description is sources alone; the next is sources combined with actions; the next combines sources and action with thinking; and the highest describes a search as a combination of action, thinking, and focus. A further research question is whether there is a relationship between this hierarchy and configuration complexity, for some examples see Appendices 52-56. Data analysis will continue over the next few months, with presentation planned at the American Society for Information Science annual meeting in the fall of 1989.

DISCUSSION

Summary and Implications

These findings indicate that the cognitive and affective model of the information search process, as developed in an earlier study, holds for a large, diverse sample of library users. In most cases, thoughts about a topic became clearer and more focused as the searcher moved through the search process seeking more relevant and pertinent information. Participants' feelings accompanying these changes in thoughts matched those predicted in the model with confidence steadily increasing. Uncertainty, confusion, and frustration were prevalent at the start and diminished during the process. Feelings of being satisfied, sure, and relieved increased as participants moved toward the close of the process.

Cognitive movement during an information search was found to be related to changes in the affective experience of users, as described in Personal Construct Theory. In light of these findings, anxiety may be a natural, integral part of the construct-building process of an extended information search, particularly in the early stages.

The affective symptoms of uncertainty, confusion, and frustration were associated with cognitive states characterized by vague, unclear thoughts about a general topic. As cognitive states shifted to more narrowed, focused thoughts, a parallel shift was noted in affective symptoms of increased confidence and feeling sure, satisfied, and relieved. The corresponding shifts in thoughts and feelings were commonly experienced by users in all three types of libraries, academic, public and school.

Participants' perceptions of task, however, did not seem to match either their cognitive state or their affective symptoms in the early stages of the search. At Initiation, participants perceived their task as "gathering" and "completing" rather than "investigating" and "formulating." This finding indicates a conflict between problem state and perceived task which may contribute to a lack of tolerance for formative stages, thereby heightening the prospect of frustration and uncertainty. The strategies that participants reported employing at each stage, however, more closely matched those indicated in the model. The thoughts about process and procedure, revealed in the

study, indicate a recursive process with various levels of strategic thinking going on throughout, gradually moving toward closure.

Investigation of participants' perceptions showed awareness of a process; generally, however, findings again show a lack of tolerance for early formative stages of the search process. At Initiation, the perceptions that a clear focus can be expected and that information encountered will not be confusing conflict with the user's problem state. In the majority of cases, a preference was indicated for finding everything first and then reading, rather than the process-oriented approach of reading to learn along the way.

While participants' thoughts matched the model by moving from vague, general descriptions of their topics to clearer, more narrowed ones, only half made focused statements about their topic at any point of the search process. A focused statement reveals a personal perspective or point of view on a topic derived from internalizing the information encountered in a search, providing evidence that learning has taken place. For some, this may not have occurred until the writing process or may not have been a required outcome of the search task. There may be other users, however, who were not able to formulate a personalized focus within the search process. Further study of this area is needed.

Difference by Type of Library

The model was validated for academic and public library users, as well as high school students. One significant difference by type of library was that the high school students were more uncertain and doubtful at all three stages than the participants from academic or public libraries. While the college and high school students indicated the same confidence at Initiation, the academic participants revealed significantly more confidence at Closure. The public library users were more confident throughout the process.

The findings also show a more active process for the academic and public library participants with the application of a number of strategies earlier in the process. These results indicate that students would benefit from process interventions as they work through an extended information search and as part of their education in preparation for applying information skills in the work place and for life-long learning.

Assessment of Study by Participating Librarians

On Monday, November 14, 1988, Kuhlthau and Belvin presented the results of the study to an audience of approximately 150 at the annual joint conference of the Educational Media Association of New Jersey (EMAnj), the New Jersey Library Association (NJLA), and the New Jersey Library Trustees Association (NJLTA), held in New Brunswick. The session was called "The Information Search Process: From Theory into Practice." Following their description of previous work, the research design, and data analysis, Kuhlthau took questions from the audience, then summarized the three main findings of the study:

1. Her search process model was validated for academic (undergraduate) and public library users, as well as for high school students.

2. There is a significant change, predictable from the Kuhlthau Model, in users' thoughts and feelings in the course of an extended information-seeking project.

3. Users in school, academic, and public libraries all experienced a conflict between their original, simplistic understanding of their task ("to gather information") and the evolutionary nature of the search process.

The second part of the session was an informal panel discussion with ten librarians who had collected data for the study. They were: Martha Hess, East Brunswick Public Library; Marie Heagney, Morris County Public Library; Joan Robbins, Hammonton High School; Irma McVey, Lower Cape May Regional High School; Patricia Preising, Hopewell Valley Central High School; Caroline Knauss, Wallington High School; Mary Jane McNally, Basking Ridge High School; Ellen Nemeth, Bridgewater-Raritan High School; Linda Bolesta, Library Media Center, Gloucester County College; and Sr. Anita Taler, McLaughlin Library, Seton Hall University. Kuhlthau asked them to reflect on two things, what they observed their users doing in the course of the study, and what they learned from the study that they expect to apply in their future work.

Panelists reacted to the first query by saying that users - even ones who said they were confident about sources - did not feel they needed to explore their topics before collecting detailed information. This misapprehension frequently led users to abandon their original topics, but once they did achieve a personal focus, they had relatively "clear sailing" to completion of the project. Users also conferred much more often with experts than with librarians about sources.

A public librarian on the panel mentioned that it was difficult to identify users at precisely the Initiation stage of an extended project, that most people had already gotten beyond that point or were continuing work on a lifelong topic of interest by the time they sought assistance from a librarian. On the other hand, public library users who agreed to participate were extremely conscientious about completing the study instruments and seemed to feel that their participation was a sort of pay-back for extensive personal attention from the librarian.

A high school librarian on the panel commented that it was difficult for her students to describe in words what they were doing at the Initiation, Midpoint, and Closure phases. She said that the Flowchart seemed a very valuable alternate device to capture this information. Another, virtually universal, sentiment was the discrepancy these librarians perceived between what users said they should be doing and what they were actually doing at different points, a situation often described as procrastination.

Several panelists concurred that it was difficult to obtain cooperation of classroom teachers for their students to participate because of the extra class time needed for students to complete the instruments. All the panelists agreed that the training Workshop they

took part in prior to the study had been extremely useful in changing their perceptions of how users view the search process, and that consequently the hardest part of their involvement in the study was being careful not to intervene. Everyone instinctively wanted to share information about the Kuhlthau Model with users, but realized that to do so would contaminate the study.

As to how their participation in the study is likely to affect their professional work from now on, there was a unanimous sentiment from the panelists that knowledge of the model will help them perform better reference interviews, taking into account the user's stage in the search process, and that - for school and academic librarians - the experience will help them better collaborate with teachers. For instance, high school teachers and college professors often require a thesis statement, outline, and bibliography from students at too early a point in the project, when, according to the model, students should still be exploring information and attempting to form a focus.

Other practical outcomes for these librarians were the tactics of having each user keep a journal throughout the search process, of brainstorming as a technique at the beginning of a search task, of compiling a large calendar that indicates where students should be in the process in any given week, of teaming up with a classroom instructor to coach students through their information-seeking project, and of having students who have already been through the process reassure those who are involved with it for the first time.

Someone also mentioned how her knowledge of how users' cognitive and affective states fluctuate throughout an information search has inspired her to approach them more sympathetically in the reference room. Another person said she is now more skillful at asking users why they need certain information, not to pry into private motives, but to give her a sense for their place in the process. Yet another panelist commented on how she sees her reference role having changed, that she is now doing more teaching and less gathering of sources for users.

On the one hand, the users' perceptions showed a readiness to employ librarians as more active mediators in the search process. On the other hand, the librarians who were exposed to the Kuhlthau Model showed a greater awareness for the need for process intervention. Further study is indicated in the development of process interventions and the measurement of the impact on users' processes and outcomes.

CHAPTER 4: EDUCATION PHASE

As the first phase of the project concentrated on research, the second phase concentrated on education. The M.L.S. and Professional Development Programs at Rutgers were key to the effort to extend process theory into the profession.

MODULES FOR INFUSION INTO THE M.L.S.

Results of the research were formulated into four learning modules for incorporation into several courses in the M.L.S program. All of the modules stress cognitive approaches to information searching and introduce the model as a means to expedite the paradigm shift from concentration on the information system to consideration for the information seeker. Through in-class simulations related to assignments and readings, students will experience the process of information seeking and test the model in their own search activities.

Since all permanent additions and revisions to courses offered for credit by the Department of Library and Information Studies in either the M.L.S. or Professional Development Program must have appropriate faculty and administrative approval, these learning modules are now being reviewed by the required chain of command.

The modules have been prepared and field tested by Carol Kuhlthau and Mary George and may be adopted by other schools with M.L.S. programs. The Generic Module may be uses in any course with an assigned research paper. The Reference Module is planned for a reference or bibliography course. The other two modules are tailored for courses in a School Library Media Certification Program and for a course in Bibliographic Instruction.

Following the presentation, an article describing the modules will be submitted to the Journal for Education for Library and Information Science.

GENERIC MODULE TO BE INTEGRATED INTO AN M.L.S. COURSE

Setting & Purpose: This module is designed to be incorporated in brief segments, totaling approximately 90 minutes, in any M.L.S. course that requires an extended research project due at or before the final class period. It allows students to examine critically their own thoughts, feelings, and actions as they focus their topics and identify relevant sources. It also helps students appreciate the complexity of the information search process and the profound impact of that process on all aspects of information studies.

General Objective: Students will understand the cognitive, affective, and procedural stages of the information search process and its significance in all areas of librarianship.

Terminal Objectives:
Students will:

1. Describe the six stages of the information search process in terms of the tasks, thoughts, feelings, and actions of the searcher.

2. Identify typical search behaviors, both verbal and non-verbal, corresponding to each of the six stages of the information search process.
3. Be able to apply process concepts to the subject matter of the course and to whatever area of the information profession they enter.

GENERIC MODULE OUTLINE

1. On the day the research project is first discussed, spend about five minutes to explain to students that they will be examining the information search process as they experience it in the course of the term project.
2. About a week later, poll students in class about their topics: what they feel, think, and have done so far. Summarize their experiences by pointing out the range of "places" people are and the feelings they have in common - typically uncertainty and a sense of being the only person feeling that way. Describe the six stages of the information search process, using Kuhlthau's charts as handouts. Depending on class size, this segment should take 30-40 minutes.
3. Give a reading assignment of one or more articles by Kuhlthau describing the information search process, due whenever you schedule the next segment.
4. Two or three weeks before the project is due, spend 20-25 minutes polling students again about their progress, concentrating on whether they have formed a focus yet. Summarize, emphasizing that it is normal to have variation regarding focus within any group and that the searcher's confidence level almost always rises following the focus decision. If any students have changed their topics, comment that that, too, is normal, and that because those people will be starting from scratch, they will feel "behind" and may be more anxious than others.
5. The day the project is turned in (or otherwise completed by students), lead them in a 20-minute discussion about the entire information search process, especially the changes in their feelings and thoughts and the interplay of the two as their search proceeded. Guide them to extrapolate their experience and to suggest ways to reflect this sensitivity in their professional work.

Notes:

If you have students keep a search log as they work on their project, tell them to include their observations on the process as well as a record of their procedure.

If there is a final exam, include an essay question that has students describe the information search process and how they would apply process concepts to the subject matter of the course.

If you can add questions to the course evaluation, ask students how the information search process component affects their view of the role of the information specialist.

MODULE FOR A REFERENCE OR BIBLIOGRAPHY/SOURCES COURSE

Setting & Purpose: This module is designed to take parts of at least two class sessions. It is intended to integrate the dynamics of the information seeking process - the user's thoughts, feelings, and search steps - with coverage of the reference interview and the characteristics of specific tools.

General Objective: Students will understand the cognitive, affective, and procedural stages of the information search process and will take these factors into account when counseling users.

Terminal Objectives:
Students will:
1. Describe the six stages of the information search process in terms of the tasks, thoughts, feelings, and actions of the searcher.
2. Identify typical searcher behaviors, both verbal and non-verbal, corresponding to each of the six stages of the information search process.
3. Demonstrate appropriate interventions on the part of the reference librarian at each of the six stages of the information search process.
4. Explain the purpose of specific search strategies at each stage of the information search process.

REFERENCE MODULE OUTLINE

1. Prior to the first presentation of the reference interview, assign one or more readings of articles by Kuhlthau.
2. During the first presentation of the reference interview, discuss with students their personal experiences in the past when seeking information, including any memorable encounters with reference librarians. Ask students to speculate about what made their experiences and those encounters either especially pleasant or painful. Then lecture on the stages of the Kuhlthau Model and its relation to the reference interview process; that it takes into account not only the user's expressed and refined information need, level of sophistication, and previous actions, but also his or her stage in the information search process.
3. Assign students to observe librarian-user interactions at a reference desk and record what is both asked and done. Have students analyze their observations in the framework of the information search process and exchange their written analyses with several other students.
4. At a later session on the reference interview, discuss the observations and analyses with students. Have students do brief role playing and/or watch videos of reference interviews, paying special attention to how the "user" expresses his or her need in cognitive and affective terms, and how the "librarian" counters with appropriate language and search suggestions.

5. As students learn the types of reference tools, the features of specific titles, and search strategy patterns, highlight how each tool or strategy might fit into the information search process.
6. Incorporate questions about the information search process in the final examination or project for the course, as well as in the course evaluation. One way is to have students read or view a complicated reference case study, then have them diagram and discuss where the user falls on a search process timeline, indicating how they would proceed with the encounter.

The Reference Module is planned for a reference or bibliography course, such as the following offered in the Rutgers M.L.S program:
17:610:504 Information Resources (3 credits).
A core course required of all students, which currently introduces the various types of general reference tools and information resources.

17:610:540 Information Resources in the Humanities (3 credits).Pre- or corequisite: 17:610:504.
A survey and evaluation of the principal reference tools and resources in the humanities.

17:610:541 Government Information Resources (3 credits).
Pre- or corequisite: 17:610:504. An introduction to the nature and use of federal, state, local, foreign, and international government resources; problems relating to the acquisition, bibliographical organization, and reference use of public documents.

17:610:542 Information Resources in Science and Technology (3 credits). Pre- or corequisite: 17:610:504.
Study of the bibilographical structure and sources used in building and servicing collections and providing information in the basic and applied sciences.

17:610:543 Information Resources in Business and Economics (3 credits). Pre- or corequisite: 17:610:504.
A study of the generation and dissemination of business and economic information, with an emphasis on the societal implications of the communication and use of this information by private and public agencies.

17:610:544 Information Resources in the Social Sciences
(3 credits). Pre- or corequisite: 17:610:504.
Study of the information infrastructure of the social sciences, with reference to the methodologies of the individual disciplines.

MODULE FOR A SCHOOL LIBRARY MEDIA CERTIFICATION PROGRAM

Setting & Purpose: This module is designed to be incorporated in brief segments, totaling 2 hours, in any course preparing school library media specialists for kindergarten through twelfth grade certification. It assumes a short research paper due in the middle of

the term and a lesson plan due several weeks later. It allows students to examine critically their own thoughts, feelings, and actions as they focus their topics and identify relevant information. Students will design instruction to teach one or more aspects of the information search process as one of the course requirements.

General Objective: Students will understand the cognitive, affective, and procedural stages of the information search process and will be able to instruct students and advise teachers appropriately.

Terminal Objectives:
Students will:

1. Describe the six stages of the information search process in terms of the tasks, thoughts, feelings, and actions of the searcher.
2. Identify typical search behaviors, both verbal and non-verbal, corresponding to each of the six stages of the information search process.
3. Demonstrate appropriate interventions and instruction at each of the six stages of the information search process.
4. Explain the purpose of specific strategies at each stage of the information search process and be able to adapt strategies to various grade levels.

SCHOOL LIBRARY MODULE OUTLINE

1. When the short research paper is first discussed, spend about five minutes explaining to students that they will be examining the information search process as they experience it in the course of this project.
2. About a week later, poll students in class about their topics: what they feel, think, and have done so far. Summarize their experiences by pointing out the range of "places" people are and the feelings they have in common - typically uncertainty and a sense of being the only person feeling that way. Describe the six stages of the information search process, using Kuhlthau's charts as handouts. Depending on class size, this segment should take 30-40 minutes.

   Assign students to read one or more articles by Kuhlthau and selected chapters in her book Teaching the Library Research Process, due whenever you schedule the next segment.
3. Two or three weeks before the project is due, spend 30 minutes polling students again about their progress, concentrating on whether they have formed a focus yet. Summarize, emphasizing that it is normal to have variation regarding focus within any group and that the searcher's confidence level almost always rises following the focus decision. If any students have changed their topics, comment that that, too, is normal, and that because those people will be starting from scratch, they will feel "behind" and may be more anxious than others.

4. The day the short paper is turned in, lead students in a 20-minute discussion about the entire information search process, especially the changes in their feelings and thoughts and the interplay of the two as their search proceeded. Guide them to draw from their experience and have them suggest ways to reflect this process in a media center program.
5. Require students to design a lesson plan including one or more stages of the information search process for a specific grade level. Have students present their lesson plans briefly in one class session.

BIBLIOGRAPHIC INSTRUCTION MODULE

Setting & Purpose: This module is designed to be included in a bibliographic instruction course or workshop of any length. It introduces students to the Kuhlthau Model of the information search process and teaches them how they in turn can explain the model to the users whom they instruct.

General Objective: Students will understand the significance of the information search process in bibliographic instruction, regardless of the type of library, level of the audience or the discipline(s) involved, and will appropriately incorporate features of the model in whatever mode of instruction they implement.

Terminal Objectives:
Students will:

1. Describe the six stages of the information search process in terms of the tasks, thoughts, feelings, and actions of the searcher.
2. Identify typical searcher behaviors, both verbal and non-verbal, corresponding to each of the six stages of the information search process.
3. Design a bibliographic instruction program or activity (whether the mode is face-to-face, print, computer-assisted, or AV) that takes into account the information search process.
4. Evaluate the extent to which users comprehend the information search process following the bibliographic instruction program or activity.

BIBLIOGRAPHIC INSTRUCTION MODEL OUTLINE

1. At an early point in the course or workshop, describe the Kuhlthau Model and relate it to the basic search strategy "recipe" (overview; subject headings; subject search in library catalog; subject bibliographies to identify other sources; appropriate indexes; author-title search in library catalog for additional books; title search in library serial list for periodicals and newspapers). Discuss.
2. Assign students to read one or more articles by Kuhlthau and selected chapters in her book Teaching the Library Research Process.

3. As you consider the planning, design, implementation, and evaluation of a bibliographic instruction program or activity, reinforce the appropriate stages of the search process. Have students suggest ways to integrate the latter into the former.
4. When stressing concepts and search strategy, indicate how the information search process mirrors other sorts of investigations (e.g., classic scientific method) and how it is reflected in the creation and growth of new knowledge and disciplines.
5. Require students to justify the instruction they design for the course or workshop in terms of the information search process.

READING LIST FOR MODULES

Kuhlthau, Carol C.
"A Process Approach to Library Skills Instruction", School Library Media Quarterly, Winter, 1985, p.35-40.

"Perceptions of the Information Search Process in Libraries: A Study of Changes from High School Through College", Information Processing and Management, Vol. 24(4), 1988, p.419-427.

"Longitudinal Case Studies of the Information Search Process of Users in Libraries", Library and Information Science Research, 10(3), 1988, p.257-304.

"Developing a Model of a Library Search Process: Cognitive and Affective Aspects", RQ, 28(2) Winter, 1988, p.232-242.

The School Library Module and the Bibliographic Instruction Module are for more specialized courses. Kuhlthau and George will present a paper on the modules to faculty of other M.L.S. programs at the annual meeting of the Association for Library and Information Science Educators on January 4, 1989. Packets of the modules will be available for distribution at that time.

INSTITUTE

A residential Institute on "The Information Search Process" was held on the Douglass Campus of Rutgers University, New Brunswick, from June 26 through June 30, 1988, funded by the grant and supported by the Rutgers Library and Information Studies Professional Development Program. During the 1987 Rutgers summer session, a pilot Institute on "The Library Research Process for Secondary School Librarians" had been offered by Kuhlthau. The pilot was enthusiastically endorsed by participants, and shifts in their perceptions of information seeking were evident at the conclusion of the session. The 1988 Institute was modified to include academic as well as school librarians and was advertised nationally to attract applicants from outside New Jersey. In addition, several library educators were invited to attend as observers, to evaluate and critique the Institute in preparation for offering it as a model for replication.

The purpose of the Institute was to retrain practicing librar in the process approach to information seeking through immersion i and reflection on that process. It featured the following three elements:

(1) First-hand library search experience;
(2) Guidelines and recommendations for implementing process-oriented library instruction;
(3) Preparation for testing the effectiveness of process instruction.

Participants undertook their own investigation of a topic of their choice in a Rutgers library during the Institute That experience formed the basis for discussing and understanding stages of the search process and for considering ways to teach th process to students by emphasizing the searcher's perspective. T Institute was also planned as a model for similar programs to be at educational institutions around the country. Librarians worki with many different populations would benefit from the insights a new approaches which such Institutes would provide.

Audience

The grant offered the opportunity to reach a broad national audience of practitioners, as well as library educators and researchers. The intent was to advertise the Institute national draw attention to the concept of the process approach while attra participants from a wide geographic area. A brochure, as shown i Appendix 57, describing the Institute was widely distributed. In addition, the announcement, shown in Appendix 58 was sent to ten national professional newsletters and journals. Samples of news coverage are included, as shown in Appendix 59. The school libra media associations in five surrounding states were also notified. This promotion evidently succeeded since participants and observe came from ten states. Twenty librarians were admitted to the Institute and nineteen actually attended: five from New Jersey, from New York, three from Pennsylvania, and one each from Maryla Ohio, and Texas (see Appendix 60). Seven were high school media specialists, five were college librarians, two were district coordinators, one was county director, and one was from a state department of education. The library educators who observed the Institute represented three additional states, Florida, Iowa, an Wisconsin.

Observers

Forty-one library educators with specialization in youth se were sent announcements of the project and invited to be observe the Institute (see Appendices 61 and 62). Of the eighteen who responded, five were chosen and three attended (the other two we unable to attend due to illness and a family emergency), with th room, board, and partial travel expenses supported by the grant.

These three observers were Dr. Shirley Aaron of Florida State University, Dr. Vida Stanton of the University of Wisconsin, Milwaukee, and Dr. Kathleen Tessmer of the University of Iowa. They met together throughout the Institute and provided feedback to the director and consultant as the sessions progressed.

The library educators made a valuable contribution to this and future Institutes. It was extremely helpful to draw on their experience and advice at this formative stage. Their suggestions for improvement in the course of the week provided an opportunity to try new approaches to improve the overall effectiveness of the Institute. For example, staff incorporated their suggestion to increase time for curriculum design. The observers also recommended role playing and a poster contest which enriched the learning situation considerably.

Preparation

The Institute team consisted of Carol Kuhlthau, Institute Director; Mary George, Consultant; Jana Varlejs, Director of the Professional Development Program for the Rutgers Library and Information Studies Department; and Mary Okarma, Teaching Assistant. Jana Varlejs and her staff arranged for accommodations and meeting rooms. Mary Okarma was responsible for equipment, videotaping, and the numerous logistical details involved. Mary George shared her extensive knowledge of bibliographic instruction in academic libraries. The grant provided the funds for a stipend for Mary George and for Mary Okarma.

Preliminary packets were sent to each participant and observer containing information on the residency and instructions on how to prepare for the Institute. Participants were asked to give some thought to a subject they would like to know more about and come with a topic in mind (see Appendix 63). A bibliography of related readings, as shown in Appendix 64, was enclosed as well as a copy of Kuhlthau's article, "A Process Approach to Library Instruction." School Library Media Quarterly Winter 1985.

Description of Institute Activities

On Sunday evening, June 26, the participants registered and checked in to their apartments. The first session was held on Monday morning in a classroom where orientation and introductions took place. Packets were distributed with the same instruments used in the earlier study of library users: two Perception Questionnaires and two Flowcharts to be completed at the first and last sessions, and three Process Surveys to be submitted at appropriate times in the search process. The syllabus was reviewed and the week's schedule explained (see Appendices 65 and 66).

The task for the week was described as follows, "Research your topic and prepare a five-minute oral presentation for Wednesday evening. Your presentation is to be on your topic and not on how you went about researching in the library. Give a title, an introduction, the main points, and a conclusion. You do not need to hand in a written paper." In addition, "Keep a journal of your thoughts,

actions, and feelings as you go along, to be submitted at the end of the Institute." It was also announced that the Director's apartment would serve as a meeting place throughout the Institute for socializing and discussion, and that reserve readings would be available there.

At the Monday morning session, participants responded to the following questions in a sharing session. "What is your topic? What are you looking for? What do you expect to find? How do you feel about your task?" Assignments to four small discussion groups were then made, mixing the librarians from different types of libraries.

Then Kuhlthau gave the first presentation, "A Six Stage Model of the Information Search Process." This included a brief introduction to the theory base and a description of the stages of the model identified in her earlier research.

After lunch the participants had their first individual library search session followed by small group discussion. The groups were instructed to: "Share your thoughts, actions, and feelings. Each person should have an opportunity to describe his or her experience briefly. Confine remarks to the process you experienced and avoid discussing sources, except as they relate to process. Look for commonality in your experience. What did you expect? What happened? How do you feel about the task, the library, your ability?" Debriefing sessions led by Kuhlthau followed with each group reporting on their discussion. A flipchart was used to record the reported experiences, and common experiences were identified. This and subsequent debriefing sessions, were videotaped.

INITIATION

Felt good - positive experience
Many descriptors and tools - hard to focus
Distractions of tour groups
Travel time - time pressure- others getting ahead
Thinking of changing topic - not enough information on first one, but want to persist
Periodicals not found
Pick another topic - or library
Want to read, not collect- topic too broad now
No map available of library
Dreadful experience - books not on shelf - journal not there, or too technical
Britannica best source
Time pressure
Time wasted going to library
Sources scattered among libraries
Reluctance to ask librarian after first time or two - more comfortable to ask clerk
Tempted to change to more interesting or easier topic
Negative feeling regarding film
Ditch search strategy
Difficult to concentrate

Hard not to "grab" information
Strangeness - anxiety
Same descriptors that worked in indexes - 1/2 drawer of cards - discouragement
Change in descriptors between indexes
FRUSTRATION - annoyed - swamped - limited by time - uncomfortable
Somewhat uneasy, yet confident - would keep it simple -cut down goal
Fatigued, exasperated, "dumb" - embarrassed to be librarian
Want "perfect system" want to throw tantrum if imperfect
Changed topic - totally different - got good citation, but periodicals not in Rutgers or in Douglass but Alexander
Anxiety ahead - others know what I don't
Someone shared information - element of competition
Felt dependent, uncomfortable, strange library
Frustration - got better as started to find information
Disappointed that all books old - yet realized that doesn't matter for their topic
Journals on fiche - ask self if worth it to read fiche - inconvenienced
Physically uncomfortable - e.g., by surroundings
Should we hide books - return to shelf - give for safekeeping and not knowing rules
Don't want to "bother" staff because not sure what looking for
Wanted to read good book and not keep searching
Infotrac - librarian showed her how and she showed others - enormously helpful
Alexander frustrating - no subjects in IRIS - not for searching, only for locating - frustrated at dispersion of Rutgers collections

Mary George gave the second presentation after dinner on Monday on "Conceptual Content Models for Library Instruction." Her handouts are attached as Appendix 67. Tuesday morning was devoted to individual library research with small group discussion and debriefing in the early afternoon. Debriefing revealed the following:

MIDPOINT

Felt pretty good - some anxiety at start
Change topic - start from scratch
Time a factor - some like, some don't, added concentration
Some people finished gathering information
More comfortable with library today, once started finding things, started to relax
Calm, confident, pleased - extra trip to Alexander last night
Relaxed and excited - feeling of closure with what one has
Knew way around libraries, people friendly
Expectations for students and their work
Feeling of focus
Found research question answered in book he found - so satisfied
Bindery and missing issues
Found more material, so had to narrow

Some material too technical - has enough
Feel pretty good
Catastrophe - someone lost his notes (but not his citations)
Focus good, good computer search - has material now to read - less anxious
Simplified his focus - create categories to organize concepts
Frantic (or resigned?) - some deadends but "we'll manage"
Topic changes - satisfaction with new topic
Physical anxiety attack with first topic
Two very different experiences with Alexander staff in same area
Better feelings today; still some frustration with availability of material
Feel need to focus more
Topic change - sometimes students should change, but if knowledge need, cannot change so easily - dilemma

Kuhlthau made the third presentation in the late afternoon on, "Description of the Study Presently Being Conducted on the Information Search Process of Library Users" which was funded by U.S. Department of Education. Preliminary findings were reported confirming the earlier studies. After dinner participants shared good ideas they had used with students.

After the third and final library search session on Wednesday morning, the small group discussions considered both changes in participants' ideas about their topics and changes in their feelings. In the debriefing session, groups reported:

CLOSURE

Discussed content, each quite satisfied with information
Where does computer search come in process?
Agreement it comes later in process, but students want to start these before having focus - need good descriptors
Maybe need more than one computer search
Content discussion - more at ease - good to bounce content off group, helped crystallize ideas
Problem of too much pertinent information - need to discard
Students think they only need to read what they've collected right before they write - need to encourage reading throughout
Follow footnotes
Importance of time to obtain material and reflect
Importance of sharing at each stage - learning and research styles vary - many deviations after initiation
Task and time limitation - allocation needs to relate to desired outcomes
Satisfied, interested, outlined talk, continued research in main source
Synthesize
One source best sometimes, but leads to construct that there always is one best source

Sometimes a source not useful at start becomes best source after focus point
Tension after spending a lot of time collecting information, but still not enough on a particular point
Maybe too much preparation time for 5-minute presentation
Question of transferability of expectations to another library if one goes though process frequently, then one may not feel stress/frustration so much
Wheel without a rim image - spokes going out - after focus, have rim and all spokes point to center
See information differently - non-pertinent stuff "garbage"
After go into reading, lost sight of focus, had to go back to original questions - not only linear process, but recursive
Sometimes start narrow and it expands during research
Time restrictions still a concern - want more time to be more thorough - worried about enough time to prepare
Concern about setting to match audience

Then role playing was used to help participants practice reacting to students' search experiences on a process level. Three different role playing scenarios were sketched, as described in Appendix 68, and participants volunteered to portray the characters, a user and a librarian. All three skits, performed without rehearsal, were as instructive as they were entertaining, with excellent illustrations of "reality" and various ways the process model can inform interactions with students.

At this point participants asked to give their own presentations in the late afternoon rather than after dinner, to allow more time for brainstorming on issues related to implementation of process instruction. Each participant gave a timed five-minute presentation on the topic he or she had investigated.

During the evening session on Wednesday, participants discussed how to encourage administrators, other staff, and teachers to try a more process-oriented approach. The group then divided into teams for a poster contest illustrating "Information Shock." Posters were judged by the observers during a party that provided everyone with a well-earned, good humored break.

On Thursday the participants designed an instructional plan; the academic librarians worked with Mary George, and library media specialists with Carol Kuhlthau. Some suggestions and cautions for each stage in the process were offered by the Director and a model of an instructional plan was demonstrated. In addition, several experts - librarians who had attended the February Workshop and who had collected data for the study - visited to share their experiences and answer questions (see Appendix 69). The visitors were Theo Haynes, Rutgers - Camden; Mary Ann Miller, Middlesex County College; Sr. Anita Taler, Seton Hall University; Linda Bolesta, Gloucester County College; and Mary Jane McNally, library media specialist at Basking Ridge High School. They each presented personal accounts of improvement in student learning and motivation through use of the

process approach. The afternoon was spent on developing instructional plans individually or in teams. These were shared with the entire group in the closing session.

Evaluation

The Institute was evaluated in a number of different ways. First, the observers conferred frequently with the Director as the Institute progressed. Following their advice, adjustments were made, particularly relating to the need for more time to devote to implementation concerns and strategies. Second, participants recorded their reactions to the activities in the journals they kept throughout the entire five-day residency. Thirdly, they completed the same research instruments used in the study to assess their feelings, thoughts, and experiences during the search process. Lastly, they filled out two evaluation forms on the final day of the Institute, one from the Professional Development Office and the other from the Director of the Institute.

The participants' journals revealed their personal conflicts during their searches and a growing awareness of the complex process in which they were involved. The surveys tracked their process more objectively and the flowcharts offered a map of their perceptions. All these instruments were returned to the participants during the last session of the Institute to enable them to reflect on their total experience and make a personal assessment of what had transpired. A comparison of the librarians' responses on the Perceptions Questionnaire at the beginning and end of the Institute revealed the following changes. See attached tally sheet in Appendix 70.

A summary of the participants' evaluations of the Institute is attached. They gave the Institute a high rating in every category, and all responding stated that they would recommend the experience to others. A selection of their other comments is attached in Appendix 71. Letters received from participants a few weeks after the Institute supporting the concept are also attached in Appendices 72 and 73.

Responses to the request for feedback on how well participants understood the process and were ready to implement strategies in their situations indicated that they were fully or fairly well prepared, with none responding that they were still confused and would rather not try. Comments on whether the Institute changed perceptions are attached, Appendix 74.

Clearly the Institute was a success, to judge from the reactions of all who attended. The observers have endorsed the search process concept and have said that they plan to implement it in their own library school teaching. The participants were responsive to the activities and ready to try the process approach with their students. The staff is convinced of the value of this approach to professional development for changing practice from a source orientation to a process approach.

Follow-up

A month after the Institute, thank you letters were sent to the observers and each has been in touch with the Director with plans to incorporate the process concept into their curriculum (see letter attached in Appendix 75).

Early in October, each of the Institute participants was invited to join an implementation study. Letters, action plan and instructions are attached in Appendices 76 and 77. A group of library media specialists under the direction of Carol Kroll, Director of the Nassau County (New York) School Library System, will be involved in the implementation phase of this study. In addition, other librarians who attended the Institute have made commitments to integrate principles and methods from the Institute at their own institutions. The purpose of this, the next phase of the project, is to design and test process-approach instruction in the field and to develop models applicable to different situations for other practioners to use.

Adaptations of the Institute have been made for presentation in a one-day continuing education workshop for practioners. One was held in April 1988 for the Nassau County (New York) School Library Cooperative (recipient of the 1988 AASL Leadership Award) and another is scheduled for Anne Arundel County (Maryland) library media specialists in January 1989. Requests for the workshop far exceed what the team can present at this time.

CHAPTER 5: DISSEMINATION

PRESENTATIONS AND PUBLICATION

One of the important commitments in the grant proposal was to disseminate the findings of the research through presentations and publications. The team, under the direction of Carol Kuhlthau, has been actively involved in presenting preliminary findings and has developed a comprehensive plan for disseminating the final report. These efforts are being directed toward a broad range of library practioners, educators, and researchers.

The following is a list of the presentations which have been made at two national and four state conferences. The last names of the members of the team making the presentations are enclosed in parentheses after each title.

"Facilitating Information Seeking Through Cognitive Modeling of the Search Process" (Kuhlthau, Turock, Belvin), American Society of Information Science (ASIS), Annual Meeting, Atlanta, GA, October 24, 1988.

American Association of School Librarians (AASL), Research Committee - preliminary report (Kuhlthau), New Orleans, LA, July 11, 1988.

"The Information Search Process in Libraries" (Kuhlthau), New Jersey Library Association/Educational Media Association of New Jersey (EMAnj), Annual Spring Conference, Atlantic City, NJ, May 13, 1988.

"The Teaching Role of the Media Coordinator" (Kuhlthau), North Carolina Association of School Libraries (NCASL), Biennial Work Conference, General Session, Winston-Salem, NC, October 28, 1988.

"Bibliographic Instruction in an Electronic Age" (Kuhlthau), Ohio Educational Library Media Association (OELMA)/Ohio Library Association (OLA)/Academic Library Association of Ohio (ALAO) Concurrent conference, Keynote at First General Session, Columbus, OH, November 4, 1988.

"The Information Search Process: From Theory to Practice" (Kuhlthau, Belvin), New Jersey Library Association (NJLA), Educational Media Association of New Jersey (EMAnj), Annual Fall Conference, New Brunswick, NJ, November 14, 1988.

Future presentations already scheduled for four national conferences are as follows:

"Strategies for Teaching the Information Search Process" (Kuhlthau, George), Association for Library and Information

Science Education (ALISE), Annual Conference, Curriculum Special Interest Group, Washington, DC, January 4, 1989.

"Inside the Library Research Process: Users' Thoughts and Feelings as They Seek Information" (Kuhlthau, George), Association for College and Research Libraries (ACRL) National Conference, Cincinnati, OH, April 6, 1989.

"Think About It: Critical Thinking and Library Instruction" (Kuhlthau), American Library Association (ALA)/ Library Instruction Round Table (LIRT) Annual Conference, Dallas, TX, June 25, 1989.

"Invitation to Research: Team Teaching the Library Research Process" (Kuhlthau, McNally), American Association of School Librarians, Fifth National Conference, Salt Lake City, UT, October 20, 1989.

Papers have been submitted and are under consideration both for the Jesse Shera Award and for presentation at the American Library Association Library Research Round Table Forum scheduled to be held in Dallas in 1989.

In addition there is a paper in progress on the methodology and results of the application of flowcharting to map users' perceptions of the information search process. Upon completion it will be submitted for presentation at the 1989 annual meeting of the American Society for Information Science.

Preliminary findings have appeared in the Proceedings of the American Society for Information Science, edited by Christine L. Borgman and Edward Y. H. Pai, Vol.25, Learned Information Inc., Medford, N.J., p.70-75.

Three of the papers which are scheduled to be presented will also be submitted for publication in the following journals: Journal of Education for Library and Information Science, College & Research Libraries, and School Library Media Quarterly. A number of other articles will be forthcoming.

In accordance with the commitment to disseminate information about the U.S. Department of Education grant, announcements appeared in the following publications: Rutgers Library and Information Science Alumni Newsletter and Educational Media Association of New Jersey Signal Tab.

Personal announcements were also made by members of the research team at various conferences. A list of the relevant meetings and the presenters is as follows:

Educational Media Association of New Jersey, Annual Fall Conference, Fall, 1987 (Kuhlthau).

Association for Library and Information Science Education, Annual Conference, January, 1988 (Dean Budd).

New Jersey Library Association, Annual Conference, Spring, 1988 (Kuhlthau).

American Library Association, Mid-Winter Meeting, 1988 (Turock).

American Library Association, Annual Conference, 1988 (Turock).

SYMPOSIUM

Where as the Institute was designed to change perceptions of the search process on the part of practicing librarians, and the Modules will serve to introduce M.L.S. students to the process approach of the Kuhlthau Model, the Symposium will be directed to other researchers who are attempting to model the interaction process between users and libraries (or other information systems) and to understand the nature of that interaction and its implications for effective information system design and services.

The Symposium, to take place three days in February, 1989, will be conducted by Nicholas Belkin and Carol Kuhlthau. Its objective is to bring together fifteen selected researchers who are actively working on different aspects of the general problem area, to provide a forum for discussion. A tentative schedule is attached in Appendix 78. Some of the participants will be responsible for preparing short position papers to be distributed three weeks in advance to all of the other participants. Topics include the process task and user in information systems, models of dialogue, empirical methodologies for studying information interaction, and interactive information systems design. These are not to be construed as formal treatments, but rather as points of departure for discussion. There will be three or four such papers per topic. Those who have not written papers will be asked to chair the discussion sessions or the summary session, or to participate in writing the final summary report. A short reading list of relevant papers will also be distributed in advance to all participants.

A paper on the results of the research on the information search process and the verification of the Kuhlthau Model will be one of the major presentations. The proceedings will be published by Pergamon Press.

The Symposium will both provide an excellent forum for rapidly disseminating the findings of the study to scholars who are active in the area of user-centered information research, and will promote further research into the important issues raised.

User interaction with librarians and libraries is one of the major research efforts at Rutgers, School of Communication, Information and Library Studies. The U.S. Department of Education has recognized the significance of this research and supported these efforts by awarding this and two other recent grants.

Tefko Saracevic and Lea Stewart, "Nature and Improvement of Librarian-User Interaction and Online Searching for Information Delivery in Libraries."
Nicholas Belkin and Tefko Saracevic, "Design Principles for Third Generation Online Public Access Catalogs (OPACs): Taking Account of Users and Library Use."

CHAPTER 6: CONCLUSION

PROJECT GOAL, OBJECTIVES AND OUTCOMES

The overarching goal of this effort was to initiate a change in the traditional focus of information provision in libraries from a source- and technology-driven orientation to a process-driven one, by infusing cognitive models of the search process into research and education.

The objectives for the project were accomplished in the following ways:

1. To validate a model of the search process that is generalizable to all types of libraries.

The findings of this study of three types of library users verified the model and indicated its generalizability to a wide range of library users.

Although the public library sample was relatively small (48) and warrants further study, the model held for all three types of library users.

2. To test the model as an intervention method capable of facilitating:

a.) the identification of information seekers' information needs, and
b.) the formulation of appropriate search strategies to assist in that process.

While the study was designed to verify the model of the search process, the Institute, Workshops, M.L.S Modules and some presentations were designed to test it as an intervention method. Evaluation of these efforts reveals high interest among practioners and indicate that the model may be effectively incorporated into their interaction with users, particularly in reference services and user education programs.

3. To diffuse research innovation about information seeking through the participation of librarians in the model's development, testing, and in the educational activities that follow.

The field study element of the project involved 26 libraries from three types of library environments. The librarians were given an in-depth orientation to the research at the Workshop and were offered opportunities to evaluate throughout. At the close of the project, the participating librarians described a variety of ways they had incorporated the theory into their approach to library users.

4. To infuse into the M.L.S. program appropriate education modules on the search process, gained from research and development, enabling librarians to enter practice capable of diagnosing and responding more effectively to varying levels of information need.

Modules for infusion into M.L.S. courses were developed and tested by Kuhlthau and George and described in Chapter 4 of this report. A paper on these Modules will be presented to library educators at the 1989 ALISE annual meeting and will be submitted as an article to Journal of Education for Library and Information Science.

5. To formulate the model and strategies delineated by the research and development into a Workshop and an Institute offered to librarians as continuing education through the SCILS Professional Development Studies Program and a Symposium to stimulate further research.

The Institute has been established as a fully developed course with objectives, syllabi, readings, and activities which can be replicated in other institutions for a wide range of professionals, i.e., academic, school, and public librarians as well as teachers and professors.

The Symposium is established as an effective way to bring recent research findings to the attention of researchers who are actively involved in studying similar problems.

6. To provide formative and summative evaluations of the research and education phases undertaken.

Evaluation has been made for each element in the project. In all cases the project was deemed a success by those involved.

The study provided extensive formative assessment of the search process and validated the model which can be applied to intervention with users, particularly in reference service and user education.

Participants' evaluation of the training Workshop indicates considerable success in changing perceptions of the search process. Their reunion assessment at the EMAnj conference nine months later attested to the lasting effect of the Workshop combined with their experiences during the study, establishing a strong process orientation for those librarians.

The Institute was given a high rating in every category and all responded that they would recommend the course to others.

The Modules have been successfully implemented in a number of M.L.S. courses.

7. To disseminate information about:
   a.) the significance of the model for information provision and education; and,
   b.) the activities which the research and development spawns.

An extensive plan is under way for presenting and publi
information about both the significance of the model and th
activities supported by the U.S. Department of Education fu

FUTURE RESEARCH

This research opens a number of areas for further study. T
relation of user expectation to search behavior to actual inform
retrieval (access) is a complex problem, especially because it
involves, on the one hand, the formation of private and unique m
constructs and, on the other hand, the equally private and uniqu
experiences of each user. Among the numerous research questions
spring from this project are:

1. As regards construct formation: What is the relations
between users' changing problem states and their construct
formation during the search process? What prompts users to
new constructs? How, when, and why do these constructs cha
Is there a "normal" pattern or sequence of concept formatic
regardless of the search topic? Is there a correlation bet
prior search experiences and construct formation in a new s
2. As regards search outcome: What is the relation of co
and affective elements of the search process to search out
Is there a correlation between the sequence of users' cog
and affective states and the "success" of their searches,
viewed by both users themselves and by independent judges
search product? How can the study's findings be presented
persuade task-givers, users, and mediators that search out
improve if everyone involved clearly understands the eleme
the search process? In other words, how can traditional
attitudes be changed?
3. As regards methods for eliciting users' models of the
process: What are the relative merits of cognitive mappin
flowcharting, time lines, or other kinds of graphic portra
capturing users' mental pictures of the search process?
4. As regards verification and refinement of the Kuhlthau
Does the model hold across disciplines, between novice and
users within the same discipline, when users move between
libraries or from libraries to other sources of informatic
the course of a search? How can the model assist planning
interfaces between information systems and users? How can
model enhance user education programs?
5. As regards the role of mediators in the search process
the Kuhlthau Model support a change in the traditional ro
the librarian from location-assistant to source-identifie
search counselor?
6. As regards new technologies: How do the results of t
study apply to the design of online catalogs, end-user
bibliographic databases, and searcher training?
7. As regards users' perceptions of the search task: Ho
users' understanding of their search task be better align

END

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